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wherein S: area [cm²] of light-receiving section

hv: photon energy [J]

q: electron volt [J]

It is equation (1) that these equations are represented with respect to each wavelength.

Embodiments of the present invention will now be described in detail.

Fig. 1 is a perspective view showing a partial cross-sectional view of a spectroscopic sensor that measures incident light, according to an embodiment of the present invention.

In this figure, reference numeral 1 indicates an n-type silicon substrate (n-type substrate), reference numeral 2 indicates a p-type diffusion layer (p-type well) formed in the n-type silicon substrate 1, reference numeral 3 indicates an n⁺ diffusion layer formed at a part of the p-type diffusion layer 2, reference numeral 4 indicates a silicon oxide (SiO₂) film formed on the p-type diffusion layer 2, reference numeral 5 indicates an Al electrode that is connected to the n⁺ diffusion layer 3 and is connected to a measuring device 9, reference numeral 6 indicates an electrode that is connected to the p-type diffusion layer 2 and is connected to ground, reference numeral 7 indicates a polycrystalline silicon (poly-Si) film formed on the upper part of the silicon oxide film 4 and being doped with an

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CLAIMS

1. (Amended)

A method for measuring incident light employing a semiconductor structure comprising an electrode film (7) transmitting incident light and being applied with a gate voltage; a first diffusion layer (2) for capturing electrons generated by the incident light, the first diffusion layer (2) being disposed under the electrode film (7) with an insulating film (4) provided therebetween; a second diffusion layer (3) for taking out electrons captured in the first diffusion layer (2) to the outside, the second diffusion layer (3) being disposed at one end of the first diffusion layer (2); a first electrode (5) that is connected to the second diffusion layer (3) and that takes out the captured electrons to the outside; and a second electrode (6) that is connected to another end opposing to the second diffusion layer (3) disposed in the first diffusion layer (2) and that establishes an electric potential of the first diffusion layer (2), wherein the gate voltage is varied, the depth from the surface of the first diffusion layer (2) in which electrons are captured is varied on the basis of wavelength and intensity of the incident light, and a current indicating the quantity of the electrons is measured, thereby measuring wavelength and intensity of the incident

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light.

2. The method for measuring incident light according to claim 1, wherein the number of times of varying the gate voltage is set according to the type of the incident light.

3. (Amended)

A spectroscopic sensor comprising:

- (a) a semiconductor substrate (1);
- (b) a first diffusion layer (2) provided on the semiconductor substrate (1);
- (c) a second diffusion layer (3) for taking out electrons captured in the first diffusion layer (2) to the outside, the second diffusion layer (3) being provided at one end of the first diffusion layer (2);
- (d) a first electrode (5) that is connected to the second diffusion layer (3) and that takes out the captured electrons to the outside;
- (e) a second electrode (6) that is connected to another end opposing to the second diffusion layer (3) of the first diffusion layer (2) and that establishes an electric potential of the first diffusion layer (2);
- (f) an electrode film (7) provided on the first diffusion layer (2) with an insulating film (4) provided therebetween, the electrode film (7) transmitting incident light and being applied with a gate voltage; and
- (g) means that measures wavelength and intensity of the

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incident light by varying the gate voltage, varying the depth from the surface of the first diffusion layer (2) in which electrons generated by the incident light are captured on the basis of wavelength and intensity of the incident light so as to correspond to the gate voltage, and measuring a current indicating the quantity of the electrons.

4. (Amended) The spectroscopic sensor according to claim 3, wherein the first diffusion layer (2) comprises a p-type diffusion layer, the second diffusion layer (3) comprises an n⁺ diffusion layer, and the semiconductor substrate (1) comprises an n-type semiconductor substrate.

5. (Amended) The spectroscopic sensor according to claim 3, wherein the electrode film (7) being applied with a gate voltage is a polycrystalline silicon film doped with an impurity.

6. A color image sensor without a color filter comprising a spectroscopic sensor array including the spectroscopic sensors according to claim 3 being disposed one dimensionally or two-dimensionally, wherein the spectroscopic sensor array is switched with a shift register formed with the spectroscopic sensor array to read signals, the depth for capturing electrons is varied to measure signals at each time, and the intensities of wavelengths of red, green, and blue are calculated from the signals to output color image signals.

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7. The color image sensor without a color filter according to claim 6, further comprising a noise-eliminating circuit provided at an output part of the color image signals.

8. The color image sensor without a color filter according to claim 6, wherein the depth for capturing electrons is varied every 1/180 seconds.